

1. Introduction

There are two broad categories of conscious perception: (1) *exteroceptive* (e.g., seeing an image on a computer screen) and (2) *interoceptive* (e.g., imagination, hallucinations, dreams, etc.). The neural mechanisms that emerge these two kinds of conscious perception are not fully known. Previous studies have used imagery or patient groups with spontaneous hallucinations to study interoceptive conscious perception [1, 2, 3]. The current investigation uses afterimages as a model of illusory, interoceptive conscious perception in healthy participants.

Primary Aim

Use afterimages and perceptually-matched mock afterimages to identify the neural mechanisms for interoceptive, illusory conscious perception.

2. Participants

Behavioral Study: 31 healthy participants

10 males; Mean age: 29.5 years

7T fMRI Study: 6 healthy participants (Target sample N = 30)

2 males; Mean age: 24.2 years

3. Methods and Materials

Whole-Brain 7T fMRI

TR: 1000ms; TE: 22ms; Voxel size: 1.2mm³

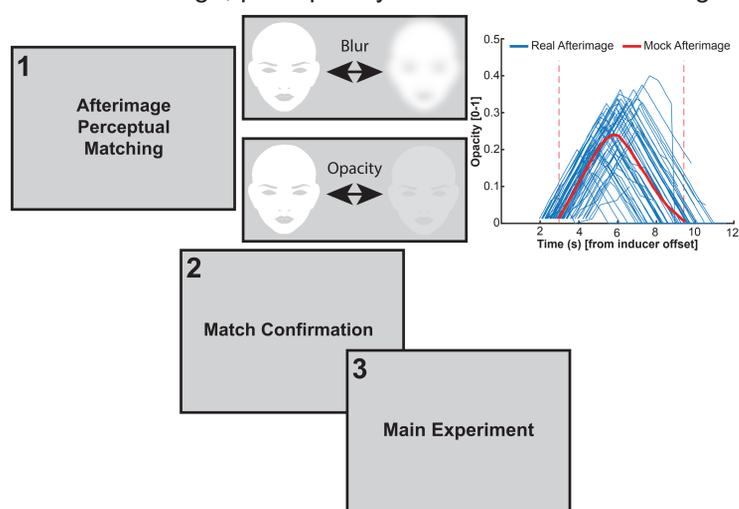
Pupillometry and Eye-Tracking

EyeLink 1000 Plus (SR Research, Inc.); 1000Hz; Right eye

4. Behavioral Paradigm

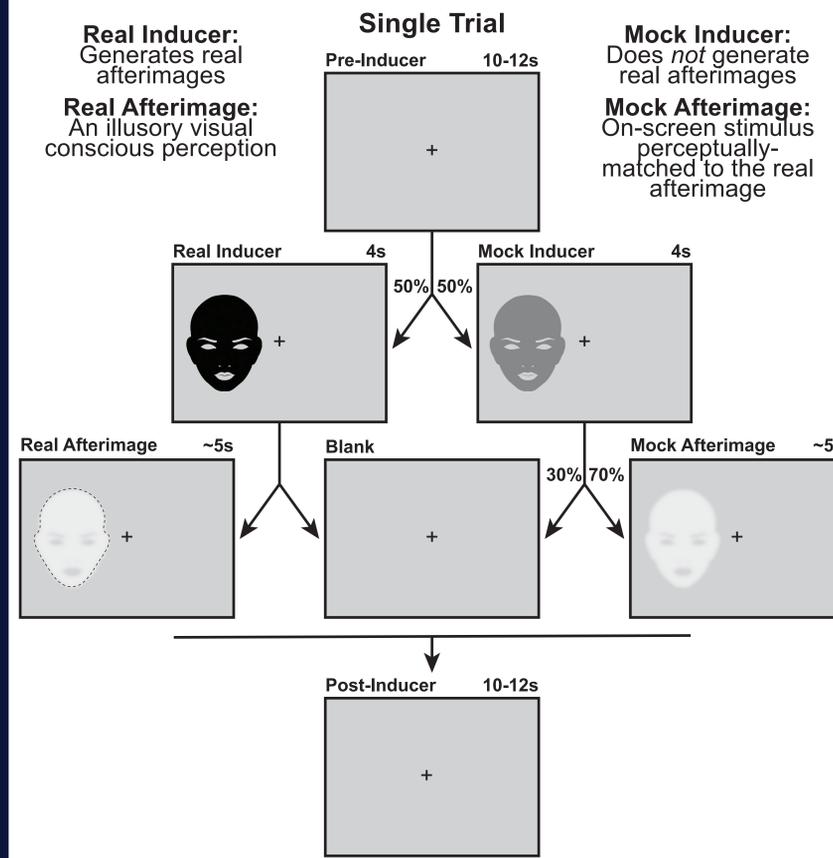
The behavioral paradigm is broken into three main task phases: (1) afterimage perceptual matching, (2) matching confirmation, and (3) main experiment.

Participants reported on the perceived image of afterimages (e.g., blur and opacity). This information was used to create a "mock" afterimage, perceptually-matched to real afterimages.

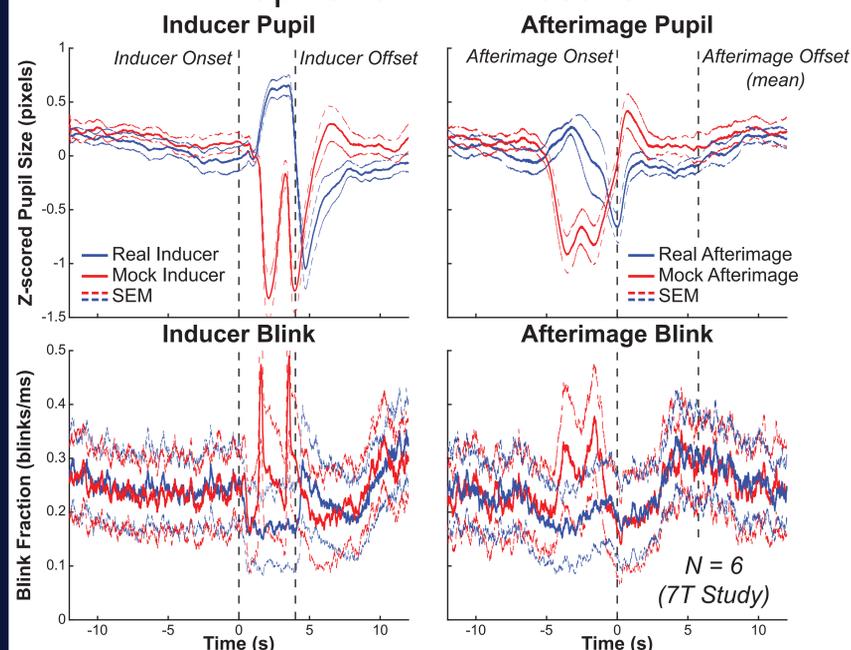


5. Behavioral Paradigm - Main Experiment

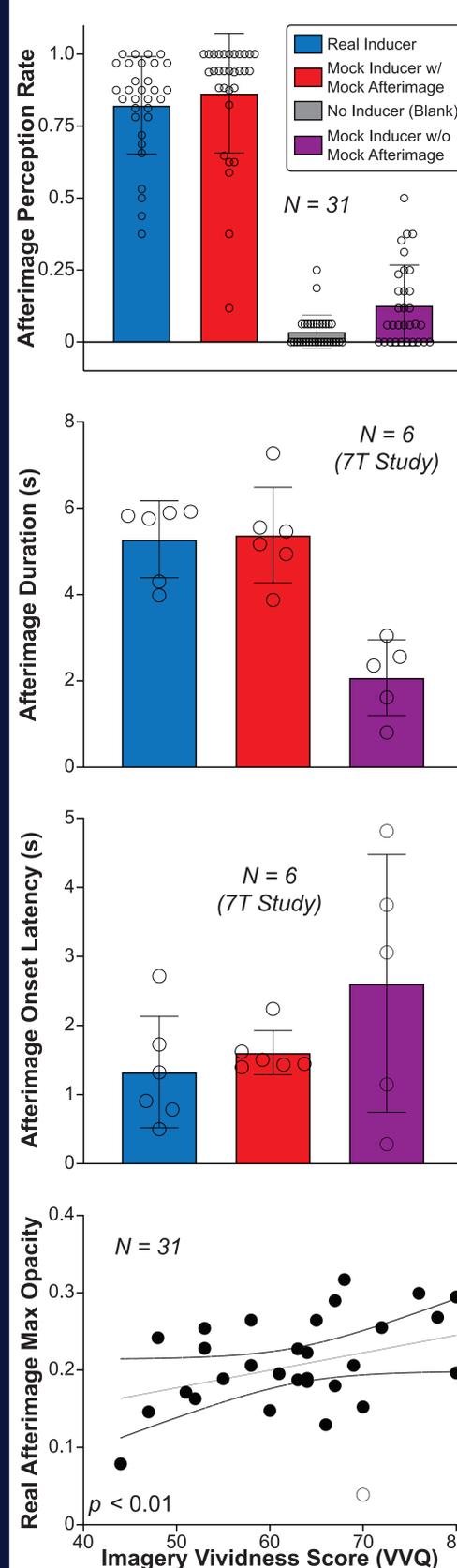
The main experiment is broken into blocks of 28 trials each (~12 minutes). A single main experiment trial is detailed below:



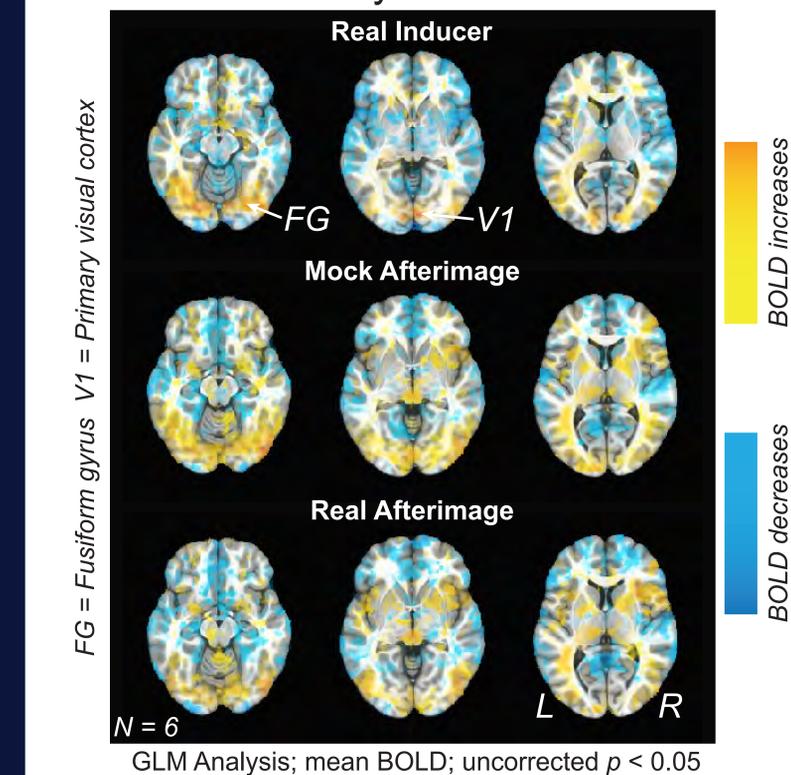
6. Pupil and Blink Results



7. Behavioral Results



8. Preliminary fMRI Results



9. Conclusions

- (1) Real and mock afterimages can be perceptually-matched.
- (2) The opacity of real afterimages and the vividness of mental imagery are positively correlated.
- (3) Preliminary fMRI results show larger V1 and FG responses for the inducer and mock afterimage stimuli than for the real afterimage.

Future Directions

- (1) Complete whole-brain fMRI data collection; target sample size is 30 healthy participants.
- (2) Collect layer-resolution V1, LGN, and retina fMRI.
- (3) MEG dataset collection with the current behavioral paradigm to capture the temporal dynamics of neurophysiology.

10. References

1. Ffytche, D. H., et al. (1998). "The anatomy of conscious vision: an fMRI study of visual hallucinations." *Nat Neurosci* 1(8): 738-742.
2. Lee, S. H., et al. (2012). "Disentangling visual imagery and perception of real-world objects." *Neuroimage* 59(4): 4064-4073.
3. Persichetti, A. S., et al. (2020). "Layer-Specific Contributions to Imagined and Executed Hand Movements in Human Primary Motor Cortex." *Curr Biol* 30(9): 1721-1725 e1723.

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